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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/668,909	09/23/2003	Rune Mittet	PGS-03-03US	2531

7590 05/18/2005

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EXAMINER	
TAYLOR, VICTOR J	

ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 05/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/668,909	MITTET, RUNE	
	Examiner	Art Unit	
	Victor J. Taylor	2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *First Office Action*.

DETAILED ACTION

Drawings

1. The drawings were received on September 23, 2003. These drawings are approved.

Prior Art

2. The prior art made of record and not relied upon is considered pertinent to applicant:

I. Meng in US 6,519,532 in class 702/017 is cited for the method for 3-D depth migration and discloses all the limitations found in independent claim 1 in figure 1 with all elements of figure 1 and see the 3-D seismic data volume in lines 10-40 of column 3 and further discloses the downward extrapolation with the corrections for the azimuthal error in lines 10-60 of column 4.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Soubaras in US Patent 5,583,826.

With regard to claim 1, Soubaras discloses all the limitations for claim 1 and the seismic data processing in figure 1. He further discloses constructing the explicit depth extrapolation operators by using a "migration technique", which focuses the diffractive energy and which enables a clear image of the underground formations to be obtained, considering them as constituting a set of secondary sources. Disclosed are numerous migration techniques that are presently in use. Amongst the various techniques known in this way, He discloses that the present invention relates more particularly to the category of recursive methods based on extrapolation in depth (z) of a wave field recorded on the surface (z=0). Within this category, the methods most commonly used operate in the domain of time frequency (.omega.) and of space, which is, either (x, z), when two dimensions (2D) are under consideration or else (x, y, z) when three dimensions (3D) are under consideration. It is also possible to distinguish implicit extrapolation methods in which the extrapolated field is obtained by solving a system of linear equations, and by explicit methods in which the extrapolated field is obtained by applying a space convolution operator of F.sub.0 (.omega.,c,x,y) and by applying the following equation:

I. W.sub..omega.,z+dz (x,y) = F.sub.0 (.omega.,c,x,y)*W.sub..omega.,z (x,y) in which the * denotes convolution in (x,y).

II. W.sub.omega., z (x,y) is obtained from W.sub.t,z (x,y) which is the wave field at depth z by means of a Fourier transform on the variable t.

The extrapolation operator F.sub.0 (.omega.c,x,y) depends on c which is the local wave propagation velocity in the medium as disclosed in lines 1-60 of column 1 and 2.

He further discloses the limitation for implicit methods for dip angles with implicit methods having the advantage of being unconditionally stable, but they lead to numerical inaccuracies that increase with the dip of the geological reflectors. The "dip" corresponds to the inclination of the sensitive surfaces of the sensors relative to the horizontal, i.e. to the propagation angle relative to the vertical. In addition, the implicit methods are difficult to generalize to the 3D case in which it is necessary to make use of an anisotropic approximation known as "splitting" which consists in splitting up the extrapolation into two 2D steps in the directions of x and y. This gives rise to a poor image of reflectors for which the dip is neither in the direction x nor in the direction y as disclosed in lines 10-25 of column 2.

He further discloses the limitation for explicit methods that have the advantage of being easy to generalize to the 3D case. However, it is difficult to calculate the coefficients of the convolution operators, which guarantee stability and accuracy. In general, the operators are implemented by being calculated in advance in a table as a function of samples of underground velocity parameters as disclosed in lines 25-30 of column 3, which teaches constructing a group of operator tables from the data processes.

He further teaches wave number in the equation for the function for omega in equation 1 and teaches the Dx and Dy frequency and wave number and the indices in lines 35-50 of column 2.

Re claim 2, which stands rejected on the rejected base claim, the steps for performing the depth migration by using the explicit depth extrapolation operators is found in line 25 and the calculated coefficients are found in line 28 of column 2 and He further teaches methods of explicit extrapolation in depth that are based on the fact that the F.sub.0 does not depend on the .omega., and on c separately, but only on the ratio of .omega./c.. It is therefore possible to write F.sub.0 (.omega.c,k.sub.x,k.sub.y) = F.sub.0 (.omega./c,k.sub.x,k.sub.y) as disclosed and found in lines 63-66 of column 2. Re claims 3-7 which stand rejected on the rejected base claim, the combining of a plurality of computation programming processes steps for selecting a dip angle and a type of operator and selecting the wave number and performing the computer processes with the steps of sorting, selecting, and determining the dip angle and the wave numbers from the operator table are disclosed in lines 1-66 of column 2 and the steps for performing the computational program processes for the velocity model based on the methods of explicit extrapolation in depth are based on the fact that F.sub.0. does not depend on the .omega. and on c separately, but only on the ratio omega./c.. It is therefore possible to write F.sub.0 (.omega.c,k.sub.x,k.sub.y) = F.sub.0. (.omega./c,k.sub.x,k.sub.y) found disclosed in line 63 of column 2 of the prior general state of the computation processes and in combination with the complete US Patent.

Such computer program processes steps are routinely used by design engineers as described in many available standard handbooks of engineering calculations. For example see the Hicks Standard Handbook of Engineering Calculations (The 1976 Second Edition).

Re claims 8-10 which stand rejected on the rejected base claims, the limitation further comprising the varying operator lengths and the explicit extrapolation operator and the varying operator links with steps for interpolation of the operator table with the varying links and with the steps for a pair of first and second links are found in the equations and programming for the extrapolation operator F.sub.0 (.omega., c,x,y) for a field of up going waves at a depth Dz, a propagation velocity c and a frequency .omega., is written as follows in the (k.sub.x,k.sub.y) domain: with equation (2) F.sub.0 (.omega.,c,k.sub.x,k.sub.y) = exp jDz (.omega..sup.2 /c.sup.2-k.sub.x.sup.2 - k.sub.y.sup.2).sup.1/2 (2). Equation (1) can be written as follows in the (k.sub.x,k.sub.y) domain: With equation (3) written W.sub.omega., z+dz (k.sub.x,k.sub.y) = F.sub.0 (.omega.,c,k.sub.x,k.sub.y) W.sub..omega.,z (k.sub.x,k.sub.y)(3) .

To apply the methods to waves propagating downwardly, it suffices to take the conjugate of F.sub.0. Methods of explicit extrapolation in depth are as based on the fact that F.sub.0 does not depend on the .omega. and on c separately, but only on the ratio omega./c. It is therefore possible to write F.sub.0 (.omega.,c,k.sub.x,k.sub.y) = F.sub.0. (.omega./c,k.sub.x,k.sub.y) as disclosed in lines 50-66 of column 2 of the general state of the art in combination with the complete patent.

Re claims 11-13 which stand rejected on the rejected base claims, Soubaras teaches selecting the extrapolation operator, which is a type of operator in line 45 of column 3 and uses the equations in lines 1-66 of column 4 and column 3 of extrapolation for the depth of Dz with the omega w function found in the plurality of equations in column 3 and 4.

Re claim 14-16 which stands rejected on the rejected base claims, Soubaras teaches selecting the extrapolation operator which is a type of operator in line 45 of column 3 and uses the equation in lines 1-66 of column 4 and column 3 of extrapolation for depth Dz with the omega w function in the plurality of equations and teaches extrapolation of a wave field in time migration using the velocity model Cz (Mx, My) and the equation found in lines 1-65 in column 12 in combination with the complete patent.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor J. Taylor whose telephone number is 571-272-2281. The examiner can normally be reached on 8:00 to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on 571-272-2863. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

V. J. Taylor
12 May 2005.

John Barlow
Supervisory Patent Examiner
Technology Center 2800